

REMARKS

Claims 1-4 and 6-7 are pending in the present application. Claim 1 has been amended. Claim 10 has been added, leaving Claims 1-4, 6-7, and 10 for further consideration in the present amendment. Reconsideration and allowance of the claims is respectfully requested in view of the following remarks.

Claim Rejections Under 35 U.S.C. § 112

Claims 1-4, 6, and 7 have been rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. Applicants respectfully disagree with the Examiner's contention that the original disclosure fails to support the limitation of conducting the coating step prior to any other semiconductor manufacturing process. Support for this additional limitation can be found in paragraph 25, the four sentences, which state the following:

In yet another application, the process may be employed during the fabrication of vertical gate DRAM cells. In a vertical gate DRAM cell, the sidewalls of the isolation trench are used as the channel of the array device. The presence of dopant ions in the sidewalls, e.g., arsenic ions, would undesirably create large fluctuations on the array device threshold voltage. Preferably, the cleaning process is utilized **prior to gate oxidation** (emphasis added).

A person of ordinary skill in the art would know that during the formation of a vertical gate DRAM cell, the dopant ions are implanted in the semiconductor substrate prior to gate oxidation. Accordingly, the cleaning process described at the end of paragraph 25 takes places after the implantation of dopant ions and prior to gate oxidation. Therefore, it is clear that in this embodiment, the cleaning process occurs prior to any other semiconductor manufacturing process.

In addition, Applicants would like to point out that Claim 1 has been amended to

delete the phrase "occurs prior to formation of a barrier layer on the surface." This amendment removes the redundancy in claim 1 that the cleaning process occurs both prior to formation of a barrier layer and prior to any other semiconductor manufacturing process after the implantation of dopant ions. Claim 10 has been added to cover this deleted phrase from Claim 1 in a dependent claim.

Claim Rejections Under 35 U.S.C. § 102

A. Claims 1, 4, and 7 have been rejected under 35 U.S.C. § 102(b), as allegedly anticipated by U.S. Patent No. 4,144,634 to Chang *et al.* (hereafter referred to as "Chang"). Applicants respectfully traverse this rejection.

To anticipate a claim under 35 U.S.C. §102, a single source must contain **all** of the elements of the claim. *Lewmar Marine Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988).

Independent Claim 1 includes the limitation that "coating the semiconductor material surface is **subsequent to implantation of dopant ions** into the surface. . ." (emphasis added). Chang discloses cleaning the surface of an epitaxially grown GaAs sample (see the Example in column 5); however, Chang fails to teach or suggest that this cleaning is performed after implantation of dopant ions into the GaAs surface. Instead, the dopants present in the GaAs are formed as a result of epitaxially growing the GaAs. There is no mention in Chang of implanting the dopants in the GaAs surface. Further, a person of ordinary skill in the art would know that epitaxially growing the GaAs is a different process from the implantation of dopants.

As amended, independent Claim 1 also includes the limitation of "coating the semiconductor material surface containing the dopant ions with a solution **consisting of** a non-aqueous organic solvent selected from the group consisting of ketones, polyhydric alcohols, cyclic ethers and esters, and mixtures thereof" (emphasis added). Support for this particular amendment to Claim 1 can be found near the end of paragraph 22. As stated in MPEP § 2111.03, the transitional phrase "consisting of" excludes any element, step, or

ingredient not specified in the claim. *In re Gray*, 53 F.2d 520, 11 USPQ 255 (CCPA 1931); *Ex parte Davis*, 80 USPQ 448, 450 (Bd. App. 1948) ("consisting of" defined as "closing the claim to the inclusion of materials other than those recited except for impurities ordinarily associated therewith."). Accordingly, the cleaning solution of the semiconductor material can contain only ketones, polyhydric alcohols, cyclic ethers and esters, and mixtures thereof. Chang fails to teach cleaning a semiconductor surface with only ketones, polyhydric alcohols, cyclic ethers and esters, and mixtures thereof. In contrast, Chang discloses cleaning the GaAs surface with trichloroethylene, acetone, and alcohol (see column 5, lines 41-44). Applicants submit that trichloroethylene is not one of the organic solvents that the cleaning solution in Claim 1 can contain.

Accordingly, independent Claim 1 and dependent Claims 4 and 7, which depend therefrom, are not anticipated by Chang. Applicants therefore respectfully request the withdrawal of the 35 U.S.C. § 102(b) rejection.

B. Claims 1, 4, 6, and 7 have been rejected under 35 U.S.C. §102(e), as allegedly being anticipated by U.S. Patent No. 6,489,616 to Giedd (hereafter referred to as "Giedd"). Applicants respectfully traverse this rejection.

Independent Claim 1 recites "[a] method of cleaning a semiconductor material surface. . . comprising: coating the semiconductor material surface containing the dopant ions with a solution. . . subsequent to implantation of dopant ions into the surface and **prior to any other semiconductor manufacturing process**" (emphasis added). Giedd pertains to an infrared detector that includes a sensor having an amorphous surface layer containing organic carbon and a high dopant concentration and an underlying polymer layer. Giedd describes an implantation process that is followed by diffusing most or essentially all of the target dopant layer into the polymer layer or sputtering it off the polymer layer surface. Giedd further discloses removing any remaining dopant by, for example, cleaning the surface with a solvent such as acetone. See, e.g., column 16, lines 3-11. As such, this cleaning of the surface is not performed directly after the implantation process and before any other manufacturing process since it is performed **after** the removal of the dopant layer

from above the polymer layer.

Accordingly, independent Claim 1 and dependent Claims 4, 6, and 7, which depend therefrom, are not anticipated by Giedd. Applicants therefore respectfully request the withdrawal of the 35 U.S.C. § 102(e) rejection.

Claim Rejections Under 35 U.S.C. § 103

Claim 3 has been rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over any one of Chang and Giedd. Further, Claims 1-4, 6, and 7 have been rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over the state of the prior art admitted by the Applicants in view of Giedd. Applicants respectfully traverse these rejections.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Establishing a *prima facie* case of obviousness requires that **all elements** of the invention be disclosed in the prior art. *In re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

Independent Claim 1 provides that a semiconductor material surface is cleaned by coating it with a solvent, "wherein coating the semiconductor material surface is subsequent to implantation of dopant ions into the surface and prior to any other semiconductor manufacturing process" (emphasis added). The cited art, taken individually or in combination, fails to teach or suggest that a semiconductor material surface can be coated with a solvent for cleaning the surface **subsequent to implantation of dopant ions into the surface AND before any other semiconductor manufacturing process**.

As discussed previously, Chang discloses cleaning the surface of GaAs after forming the GaAs by epitaxial growth rather than after implanting dopants into the surface. Chang in no way suggests that the dopants are implanted into the surface before said cleaning. Further, Giedd discloses cleaning a surface of a sensor after diffusing the dopant layer into an underlying polymer layer or sputtering it off the polymer layer. Thus, Giedd in no way suggests cleaning the surface after the implantation of the dopants and before any other

semiconductor process.

In view of the foregoing, the cited art fails to render obvious independent claim 1 and 32 and dependent claims 2-4, 6, and 7, which depend therefrom. Applicants therefore respectfully request the withdrawal of the 35 U.S.C. § 103(a) rejections.


It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 09-0458 maintained by Assignee.

Respectfully submitted,

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